Critical Care Therapy and Respiratory Care Section

Category:	Clinical
Section:	Clinical Monitoring
Title:	Novametrix Transcutaneous Monitoring
Policy #:	11
Revised:	04/00

1.0 DESCRIPTION: The TCO_2M Transcutaneous CO_2/O_2 Monitor, (Model 860), is a lightweight, portable monitor that can operate on AC power or internal battery. The unit provides a continuous measurement of oxygen tension ($PtCO_2$) and transcutaneous carbon dioxide ($PtcCO_2$).

1.1 The TCO_2M is used as a trend monitor for CO_2 and O_2 tension at the skin surface for patients as an adjunct to arterial CO_2 and O_2 blood gas measurements. This equipment is **not** a blood gas device. However, it can quickly assess the efficacy of patient treatment during transport or mechanical ventilation.

1.2 Indications:

TCO_2/O_2 monitoring may be indicated for the following:

1.2.1 Head injury or trauma.

1.2.2 Pressure control ventilation, inverse ratio ventilation, or weaning maneuvers.

1.2.3 Pediatric patients.

1.2.4 Patients with respiratory compromise.

1.2.5 Unstable patients requiring transport.

1.2.6 Post-operative neurosurgical patients.

1.3 Contraindications:

1.3.1 In patients who are hemodynamically compromised, transcutaneous gas values may no longer reflect arterial gas values due to changes in blood flow to the tissue.

1.3.2 Halothane gas is the only known anesthetic gas affecting the reliability of transcutaneous oxygen ($PtcO_2$) measurement.

1.4 Precautions:

1.4.1 Patients with extremely sensitive skin should be carefully evaluated prior to monitoring as sensor heat or adhesive ring application may cause skin irritation. Skin irritation can be minimized by using alcohol or water to loosen adhesive prior to removal.

1.4.2 $PtcO_2$ levels in excess 150 mmHg may cause erroneous readings of $PtcCO_2$.

1.4.3 The location of the sensor on the patient should be changed **every four hours** to minimize the risk of heat-induced skin damage.

1.4.4 The risk of such skin damage is dependent upon sensor temperature, duration of application and physiological parameters including local perfusion, body temperature, and skin thickness. The manual recommends 41-43 degrees Centigrade for neonates and 44 degrees Centigrade for adults. *Note that these temperatures are guidelines only. The user should verify and document the temperature for each patient.*

1.4.5 To prevent cross contamination, the sensor must be cleaned and re-membraned between patients.

1.4.6 Do not touch patient while making adjustments on the TCO_2M monitor for patient and operator electrical safety.

2.0 EQUIPMENT/SUPPLIES:

2.1 Novametrix TCO_2M Monitor

2.2 Transcutanous calibrator with calibration tanks

2.3 Transcutaneous Sensor Contact Gel

2.4 TCO_2M Electrode Adhesive Rings

2.5 Pre-Soaked Split Membrane Novadisk Preparation Kits

3.0 PROCEDURE

3.1 The "Quick Start Guide" (found on page 9 in the Operator's Manual Chapter 3) summarizes and highlights the key steps and processes required to properly configure the TCO_2M monitor for operation. Please refer to the chapter for connection and calibration of the sensor, application of the sensor to the patient, handling any associated alerts, and removal of the sensor from the patient. *Note this section is an adjunct to other sections in the operator manual where the steps and processes are explained in more detail. Please refer to the operator manual for more information.*

3.1.1 Assemble equipment.

3.1.2 Wash hands.

3.1.3 Introduce yourself to the patient and explain the procedure.

3.2 Connect Sensor

3.2.1 Attach an appropriate sensor to the TCO_2M's front panel connector. The sensor will "click" into place when properly installed.

3.3 Power Up

3.3.1 Press the power key to turn on the TCO_2M.

3.3.2 The AC "ON" illuminates if the monitor is connected to the AC line and the rear panel power switch is set to "l". This also allows the internal battery to charge.

3.3.3 A battery icon appears on the display if the monitor is operating from its internal battery.

3.3.4 The base menu display appears upon completion of the power-up and self-testing cycles.

3.3.5 Press the contrast key to adjust the display for optimal viewing.

3.4 Calibrator Setup

3.4.1 Connect the Model 868 Calibrator to the small connector on the monitor's front panel.

3.4.2 Ensure that the gas cylinders are properly installed. They are color-coded. Both gauges should be registering pressure.

3.5 Calibration

3.5.1 Place the sensor into the Calibrator's Sensor Port.

3.5.2 Press the **CAL** softkey. Verify the calibration, site timer, and temperature settings. Press **START** to begin calibration.

3.5.2.1 If calibration settings need adjustment, press **SET** to adjust them.

3.5.2.2 Calibration will not begin if the sensor is not up to operating temperature. Wait until temperature is achieved and repeat the calibration process.

3.5.2.3 The monitor's site timer is automatically reset, to the user-preselected duration, at the conclusion of each successful sensor calibration.

3.5.2.4 Once the site timer's remaining time expires, the alert indicator starts to flash as does the red alert bar. An audible alarm will sound, overriding a disabled audible alert (Audio Off), and the message center will display S-TIMER EXPRD. The user should remove the sensor from the patient. The two minute alarm silence will suppress the audible alert.

NOTE: *If the user does not reset the site timer within ten minutes, the monitor will automatically shut down the heater power to the sensor, thus eliminating the risk associated with continued heating of the skin. If sensor heater power shutdown occurs, the message center flashes 10 MIN SITE TIMER EXPRD and an audible alarm will sound overriding audio off mode if enabled. The user must then reset the site timer in the CAL SETTINGS portion of the SENSOR CALIBRATION menu. (See operator manual).*

3.5.2.5 When the TCO_2M beeps and the CALIBRATION DONE message appears, press **RUN** and remove the sensor from the calibrator.

3.6 Alert Limits

3.6.1 Verify that the alert limits are properly set. If needed, press **LIMITS** to adjust.

3.6.1.1 Press **LIMIT** and SET ALERT LIMITS appears.

3.6.1.2 Use the **SEL** key to move the left pointing arrow to highlight a limit value.

3.6.1.3 Use the up/down arrows to increase/decrease the limit value.

3.6.1.4 Press **RUN** to return to main menu.

3.6.1.5 See operator's manual (page 23 of Chapter 6)for setting the AUTO ALERT LIMITS.

3.7 Apply to Patient

3.7.1 Attach an adhesive ring to the sensor face, apply a drop of contact gel, and apply the sensor to a properly prepared site.
3.7.1.1 Prep skin with alcohol.
3.7.1.2 Attach to preferred CO_2 monitoring sites: upper chest (except open-heart patients), abdomen, neck, inner arm or inner leg.
3.7.1.3 Selected site should be free of hair.
3.7.1.4 Allow 10-15 minutes for sensor stabilization.

3.8 Handling Alerts

3.8.1 To temporarily silence an audible alert and to keep the red alert bar from flashing for two minutes, press the silence key.

3.8.2 Once the parameter comes back within limits (or limits are widened), press **ALERT RESET** to clear the displayed message and flashing limit display.

3.9 Removal from Patient

3.9.1 To remove the sensor from the skin, gently peel the adhesive ring from the skin.

3.10 Monitor Shutdown

3.10.1 To turn off the TCO_2M monitor, press the power key.

3.11 RE-MEMBRANING NOVADISK: Replace the NOVADISK membrane (following directions printed on the PRE-SOAKED SPLIT MEMBRANE NOVADISK PREPARATION KITS box) under any of the following conditions:

3.11.1 When the monitor fails to calibrate.

3.11.2 Between patients.

3.11.3 After seven days of use.

3.11.4 If there is more than 50% air in the annulus.

3.11.5 If the NOVADISK has been damaged or has loosened from sensor.

3.11.6 After long periods of non-use.

3.12 POLISHING COMBINATION SENSOR: Polish the O_2 portion of the Combination Sensor once a month. The sensor may exhibit CO_2 drift of more than 2 mmHg per hour for as long as 8 hours after polishing. Again, refer to polishing instructions printed on the PRE-SOAKED SPLIT MEMBRANE NOVADISK PREPARATIONS KITS box.

4.0 CLEANING AND DISINFECTING:

4.1 Monitor

4.1.1 Turn the monitor off and unplug the line cord form the AC mains before cleaning.

4.1.2 Clean and disinfect using solutions such as isopropyl alcohol 70% solution or bleach 10% solution, then wipe with a clean water dampened cloth to rinse and dry before use.

4.1.3 Do not immerse monitor.

4.1.4 Do not attempt to sterilize monitor.

4.2 Sensors

4.2.1 Clean sensor with solutions such as isopropyl alcohol 70% solution, 2% glutheralhyde, or bleach 10% solution, then wipe with a clean water dampened cloth to rinse and dry before use.

4.2.2 Do not immerse the sensor.

4.2.3 Do not attempt to sterilize.

4.3 Calibrator

4.3.1 Disconnect the calibrator from the TCO_2M if connected before cleaning.

4.3.2 Clean calibrator with solutions such as isopropyl alcohol 70% solution or bleach 10% solution, then wipe with a clean water dampened cloth to rinse and dry before use.

4.3.3 Do not immerse the calibrator.

4.3.4 Do not attempt to sterilize the calibrator.

5.0 DOCUMENTATION: The $TcCO_2$, respiratory rate, and respiratory breathing patterns should be monitored and results documented on the ventilator flow sheet.

SIGNATURE:_____ DATE:_____
Assistant Section Chief, CCTRCS, CCMD

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Section Chief, CCTRCS, CCMD

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(Rev. 4/00)